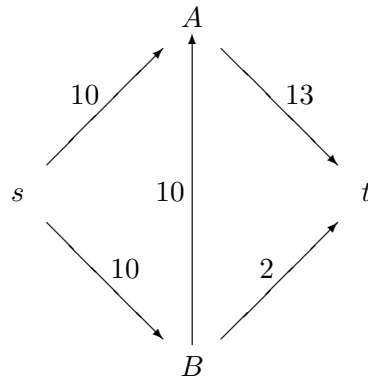


Problem Set 5, due Friday, May 9

1: Consider the system of pipes given in the figure. The number over each pipe is its capacity in gallons/minute.



i: Formulate the max flow problem for the pipes as a linear program.

ii: Calculate the dual linear program.

iii: Using either a computer, pencil and paper, or common sense, solve the max-flow problem and the dual min-cut problem, obtaining solutions x^* and y^* . Verify that complementary slackness holds; and for each pipe, find an $\epsilon > 0$ so that if the capacity of a pipe corresponding to y_j^* is changed by a number $\delta \leq \epsilon$, the maximum flow is changed by δy_j^* , and the optimal basis for the primal does not change.

2: Consider the linear program (as in the quiz)

$$\max c^t x$$

given

$$Dx = b_1$$

$$Ax \leq b_2$$

$$x \geq 0.$$

State that the complementary slackness conditions for the primal/dual pair and show that they hold. Note that an example is not enough; you need to prove it. Follow the proof of 6.3 on page 154.